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# UNITED STATES PATENT AND TRADEMARK OFFICE

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| 09/641,589 | 08/18/2000 | Philip A. Cooper | 11910-002001 | 6655 |

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| EXAMINER |
|---|
| BORLINGHAUS, JASON M |

| ART UNIT | PAPER NUMBER |
|---|---|
| 3628 | |

DATE MAILED: 09/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on <u>02 May 2005</u>.

2a)☐ This action is **FINAL**.     2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-3, 8-10 and 27* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3, 8-10 and 27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some.* c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1)☒ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail. Date _____.
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other: _____.

# DETAILED ACTION

## *Specification*

The disclosure is objected to because of the following informalities: enclosure of

appendix is improper. An appendix is limited to enclosure of a sequence listing table or

a computer program listing (see MPEP § 608.05). Otherwise, information contained

within the appendix should be incorporated into the specification or filed through an IDS.

Appropriate correction is required.

## *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claims 1 and 8 - 10** are rejected under 35 U.S.C. 103(a) as being unpatentable

over Admission (specification and appendix).

**Regarding Claim 1**, Admission discloses a method comprising:

- receiving data representing prices of options on a given asset (The idea
  that option prices determine some kind of implied probability distribution <u>is</u>
  <u>fairly well known in the financial literature</u> – see Appendix A, p. 1); and

- performing computations (second derivative) to derive from said data an
  estimate of a corresponding implied probability distribution of the price of
  said asset at a future time. ("The idea that a pdf can be computed by
  taking the second derivative of a continuous price curve <u>is known in the</u>
  <u>literature</u>, but it does not appear to be very well known." – see Appendix A,
  p. 1).

Admission does not teach a <u>machine-based</u> method comprising:

- receiving data representing <u>current prices</u> of options on a given asset;

- <u>by machine</u>, performing computations to derive from said data an estimate
  of a corresponding implied probability distribution of the price of said asset
  at a future time; and

- <u>making information about said probability distribution available within a</u>
  <u>time frame that is useful to investors.</u>

It would have been obvious to one of ordinary skill in the art at the time the
invention was made to have modified Admission by incorporating the ability to input
current prices of options into the calculations to provide the most up-to-date data for the
calculations.

Additionally, it would have been obvious to one of ordinary skill in the art at the
time the invention was made to have modified Admission by incorporating the ability to

make the information from the calculations available in a time frame that is useful for

investors, allowing the investors to actually utilize the information derived from the

calculations.

Additionally, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to have automated the method, since it has been held that

broadly providing a mechanical or automatic means to replace manual activity that

accomplishes the same result involves only routine skill in the art. *In re Venner*, 120

USPQ 192.

**Regarding Claim 8**, Admission discloses a method comprising:

- receiving data representing prices of options on a given asset, the options

  being associated with spaced-apart strike prices of the asset at a future

  time. (supra – specification, p. 9);

- the data including shifted prices of options resulting from a shifted

  underlying price of the asset. ("In the real world, the price $s$ of the

  underlying asset changes with time and there will be a corresponding

  change in option prices." – see specification, p. 12 – establishing that as

  the price of the underlying asset shifts there is a corresponding shift in the

  option price, as is the nature of options in the existing option market);

- the amount by which the asset price has shifted being different from the

  amount by which the strike prices are spaced apart. ("In practice, options

  are usually traded within certain price ranges and only for certain price

  intervals (e.g. ranging from $110 to $180 at $5 intervals). Thus, the call

and/or put option prices are known only for a finite subset of strike prices."

– see specification, p. 9 - establishing that strike prices, by the nature of

the options market, are only available in a finite number of spaced-apart

price intervals. However, the price or value of the underlying asset does

not have this limitation. The price or value of the underlying asset is not

limited to a finite number of spaced-apart intervals and, therefore, the

constrained strike prices cannot fully and accurately capture the infinite

asset prices possible. As such the amount of the shift (increase or

decrease) in the asset price (infinite possibilities) is different from the

amount by which the strike prices are spaced apart (finite intervals));

- performing computations to derive from said data an estimate of a

  quantized implied probability distribution of the price of said asset at a

  future time. ("The idea that a pdf can be computed by taking the second

  derivative of a continuous price curve is known in the literature, but it does

  not appear to be very well known." – see Appendix A, p. 1); and

- the elements of the quantized probability distribution being more finely

  spaced (smoothed) than for a probability distribution derived without the

  shifted current price data. ("Any standard smoothing and extrapolation

  method may be used…In an especially meaningful; example, we have

  experimented with a class of smoothing algorithms used in 'Implied

  Volatility Functions: Empirical Tests' by B. Dumas, J Fleming and R.E.

  Whaley, J.Finance, vol. 53, pp. 2059 – 2106, Dec. 1998…Thus, we use

the Dumas-Fleming-Whaley model for our own entirely different purpose,

that of forecasting probability distributions." – see appendix, p. 8).

Admission does not teach a method comprising:

- receiving data representing current prices of options on a given asset, the

    options being associated with spaced-apart strike prices of the asset at a

    future time;

- the data including shifted current prices of options resulting from a shifted

    underlying price of the asset; and

- by machine, performing computations to derive from said data an estimate

    of a quantized implied probability distribution of the price of said asset at a

    future time...

It would have been obvious to one of ordinary skill in the art at the time the

invention was made to have modified Admission by incorporating the ability to input

current prices of options into the calculations to provide the most up-to-date data for the

calculations.

Additionally, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to have automated the method, since it has been held that

broadly providing a mechanical or automatic means to replace manual activity that

accomplishes the same result involves only routine skill in the art. *In re Venner*, 120

USPQ 192.

**Regarding Claim 9**, Claim 9 recites similar limitations to Claims 1 and 8, in combination, and is therefore rejected using the same art and rationale as applied in the rejection of Claims 1 and 8.

**Regarding Claim 10,** Admission does not teach a method in which the smoothing operation <u>is performed in a volatility domain.</u> However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified smoothing operation, as disclosed by Admission, to allow for smoothing in any domain or for any variable that the inventor desired.


**Claims 2 - 3** are rejected under 35 U.S.C. 103(a) as being unpatentable over Admission, as in Claim 1 above, and in further view of Jackwerth (Jackwerth, Jens Carsten & Rubenstein, Mark. *Recovering Probability Distributions from Option Prices. The Journal of Finance.* vol. LI, no. 5. December 1996. pp. 1611 – 1631).

**Regarding Claim 2,** Admission discloses a method in which:

- data represent a finite number of price of options at spaced-apart (certain price intervals) strike prices of the asset. ("<u>In practice</u>, options are <u>usually traded</u> within certain price ranges and only for certain price intervals (e.g. ranging from $110 to $180 at $5 intervals). Thus, the call and/or put option prices are known only for a finite subset of strike prices." – see specification, p. 9 – establishing that strike prices, by the nature of the options market, are only available in a finite number of spaced-apart price intervals.)

- calculating a set of first set of differences (first derivative) of said prices.

  ("The idea that a pdf can be computed by taking the second derivative of a

  continuous price curve <u>is known in the literature</u>, but it does not appear to

  be very well known." – see Appendix A, p. 1 – establishing that, by virtue

  of calculating a second derivative, a first set of differences (a first

  derivative) must be calculated from option price data).

Admission does not teach a method in which:

- <u>data represent a finite number of price of options at spaced-apart strike</u>

  <u>prices of the asset, and also including;</u>

- calculating a set of first differences of said <u>finite number</u> of <u>prices to form</u>

  <u>an estimate of the cumulative probability distribution of the price of the</u>

  <u>asset at a future time.</u>

Jackwerth discloses a method in which

- data represent a finite number of strike prices of options at spaced-apart

  strike prices of the asset. ("Unfortunately, since observed option prices are

  only available in discretely space striking price levels, the lowest available

  striking price is well above 0 and the highest is well below infinity, there

  are many risk-neutral distributions that can risk-neutral distributions that

  can fit their market prices." – see p. 1620 – strike prices, by their nature,

  must be finite and spaced-apart); and

- calculating a set of first differences (equation 5 – see p. 1620) of said finite

  number (dataset) of prices to form an estimate of the cumulative

probability distribution of the price of the asset. ("...by carefully executing

the optimization and monitoring the convergence, we are able to display

implied probability distributions and implied cumulative probability

distributions for the same dataset for all these functions." – see pp. 1620-

1621).

It would have been obvious to one of ordinary skill in the art at the time the

invention was made to have recognized that inputted strike price data would represent a

finite number of spaced-apart strike prices, as disclosed by Admission and Jackwerth,

as is the nature of strike prices.

Additionally, it would have been obvious to one of ordinary skill in the art at the

time the invention was made to have utilized the first set of differences calculated, as

disclosed by Admission, to form an estimate of the cumulative probability distribution of

the price of the asset, as disclosed by Jackwerth, to provide the user with a cumulative

probability distribution.

**Regarding Claim 3,** Admission discloses a method also including:

- calculating a set of second differences (second derivative) of the finite

  number of strike prices from the set of first differences (first derivative) to

  form an estimate of the probability distribution function of the price of said

  asset at a future time (supra – see Appendix, p. 1).

**Claim 27** is rejected under 35 U.S.C. 103(a) as being unpatentable over

Admission in view of Mendenhall (Mendenhall, William & Beaver, Robert J. *A Brief*

*Course in Business Statistics. Wadsworth Publishing Company.* Belmont, California.

1995. p. 177).

- defining a current value of an option as a quadratic expression that that

  depends on the difference between the current price of the option and the

  current price of the underlying security. ("The well-known idea is to think of

  an option as a kind of nonlinear portfolio – a quadratic one, to be more

  precise. Thus, an option on a single underlying security with underlying

  price $x_1$ has a price approximately $x = c + \Delta (x_1 - s_1) + \frac{1}{2} \Gamma (x_1 - s_1)^2$ for $x_1$

  near $s_1$, where the option was evaluated to a known value c." – see

  appendix, p. 18); and

- performing computations that use the quadratic expression (supra – see

  appendix, p. 18)

- to estimate a probability distribution of the value (PDF computed from

  second derivative of portfolio value x) at a future time T of a portfolio that

  includes the option (portfolio with only one item, the option). ("The idea

  that a pdf can be computed by taking the second derivative of a

  continuous price curve is known in the literature, but it does not appear to

  be very well known." – see Appendix A, p. 1).

Admission does not disclose a machine-based method comprising:

- by machine, computations that use the quadratic expression and Monte

  Carlo techniques to estimate a probability distribution of the value at a

  future time T of a portfolio that includes the option.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have automated the method, since it has been held that broadly providing a mechanical or automatic means to replace manual activity that accomplishes the same result involves only routine skill in the art. *In re Venner,* 120 USPQ 192.

Additionally, utilizing Monte Carlo techniques to derive an estimate of the distribution of variables is old and well known in the art of statistical analysis. As evidenced by Mendenhall which states "The technique of simulating a process that contains random elements and repeating the process over and over to see how it behaves is called a Monte Carlo Procedure." (see p. 177). It would have been obvious to one with ordinary skill in the art at the time invention was made to have modified Admission to incorporate a Monte Carlo technique, as disclosed by Mendenhall, to obtain random value samples by which to populate the equations and perform the computations.

### Response to Arguments

Applicant's arguments with respect to pending claims have been considered but are moot in view of the new ground(s) of rejection.
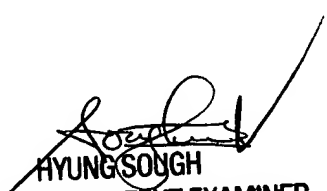
## *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason M. Borlinghaus whose telephone number is (703) 308-9552. The examiner can normally be reached on 8:30am-5:00pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hyung Sough can be reached on (703) 308-0505. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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